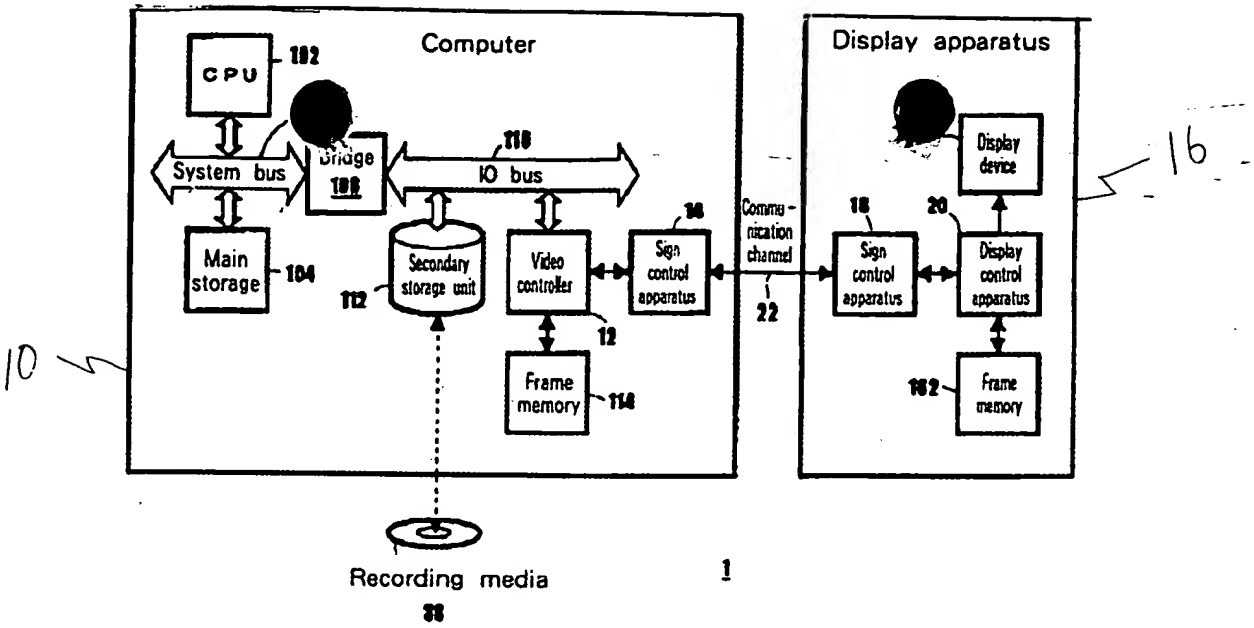

Computer
CPU
102
System bus
Bridge
108
110
IO bus
Main storage
104
Secondary storage unit
112
Video controller
12
Sign control apparatus
16
Frame memory
114
Communication channel
22
Display apparatus
18
Sign control apparatus
20
Display control apparatus
Display device
16
Frame memory
102
10
Recording media
38
1

Fig. 1

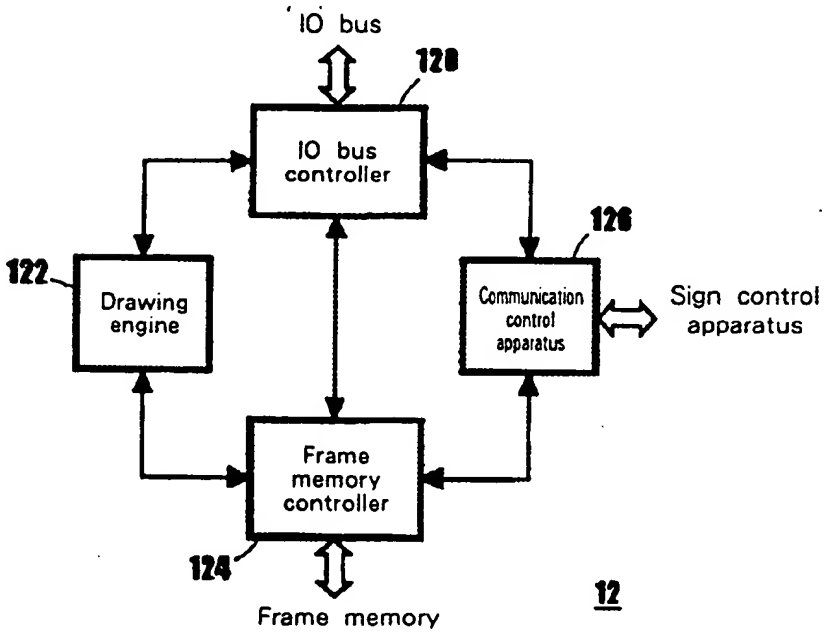

IO bus
128
IO bus controller
122
Drawing engine
126
Communication control apparatus
Sign control apparatus
Frame memory controller
124
Frame memory
12

Fig. 2

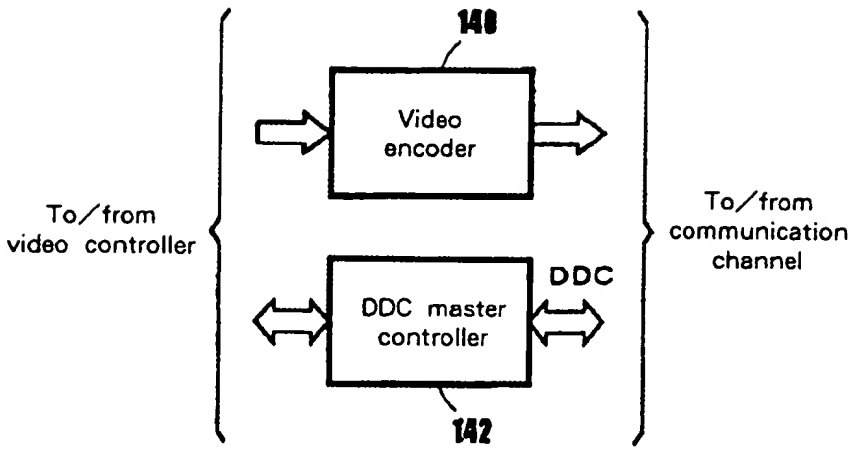

140
Video encoder
To/from video controller
To/from communication channel
DDC
DDC master controller
142
14

Fig. 3

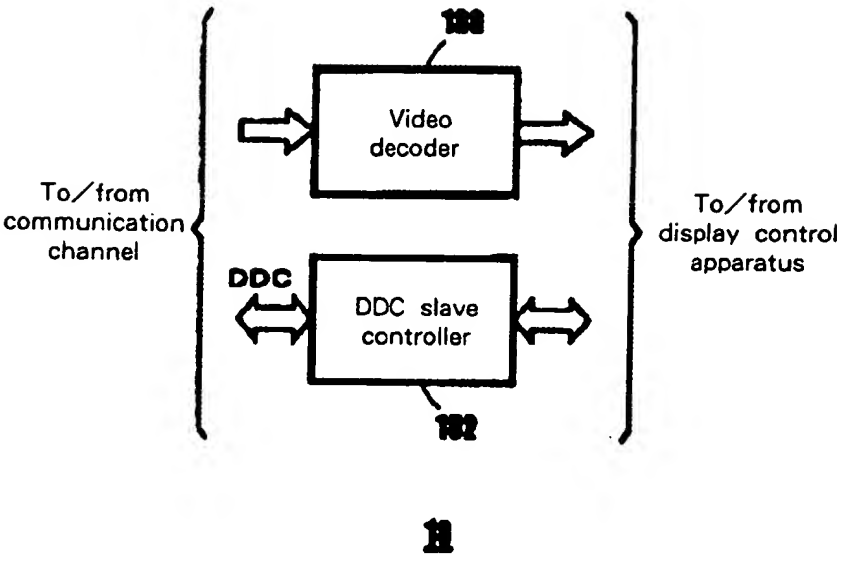

Video decoder
DDC
DDC slave controller
To/from communication channel
To/from display control apparatus

Fig. 4

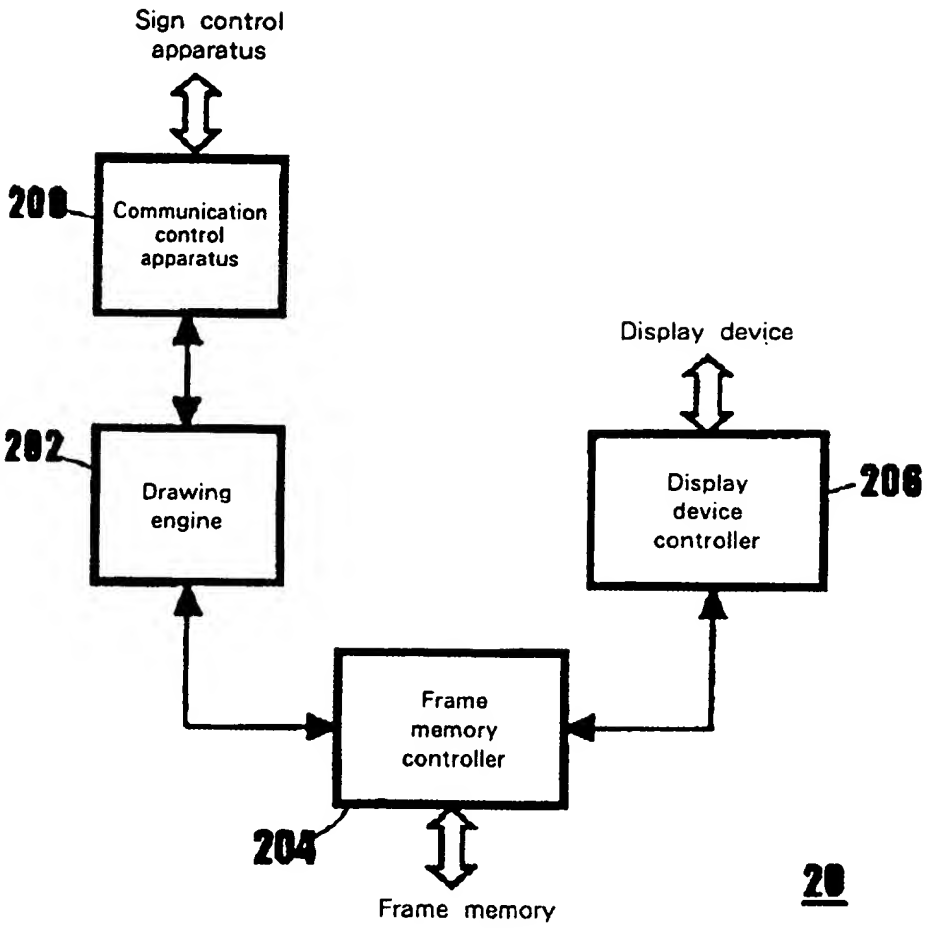

Sign control apparatus
200
Communication control apparatus
Display device
202
Drawing engine
Display device controller
206
Frame memory controller
204
Frame memory
20

Fig. 5

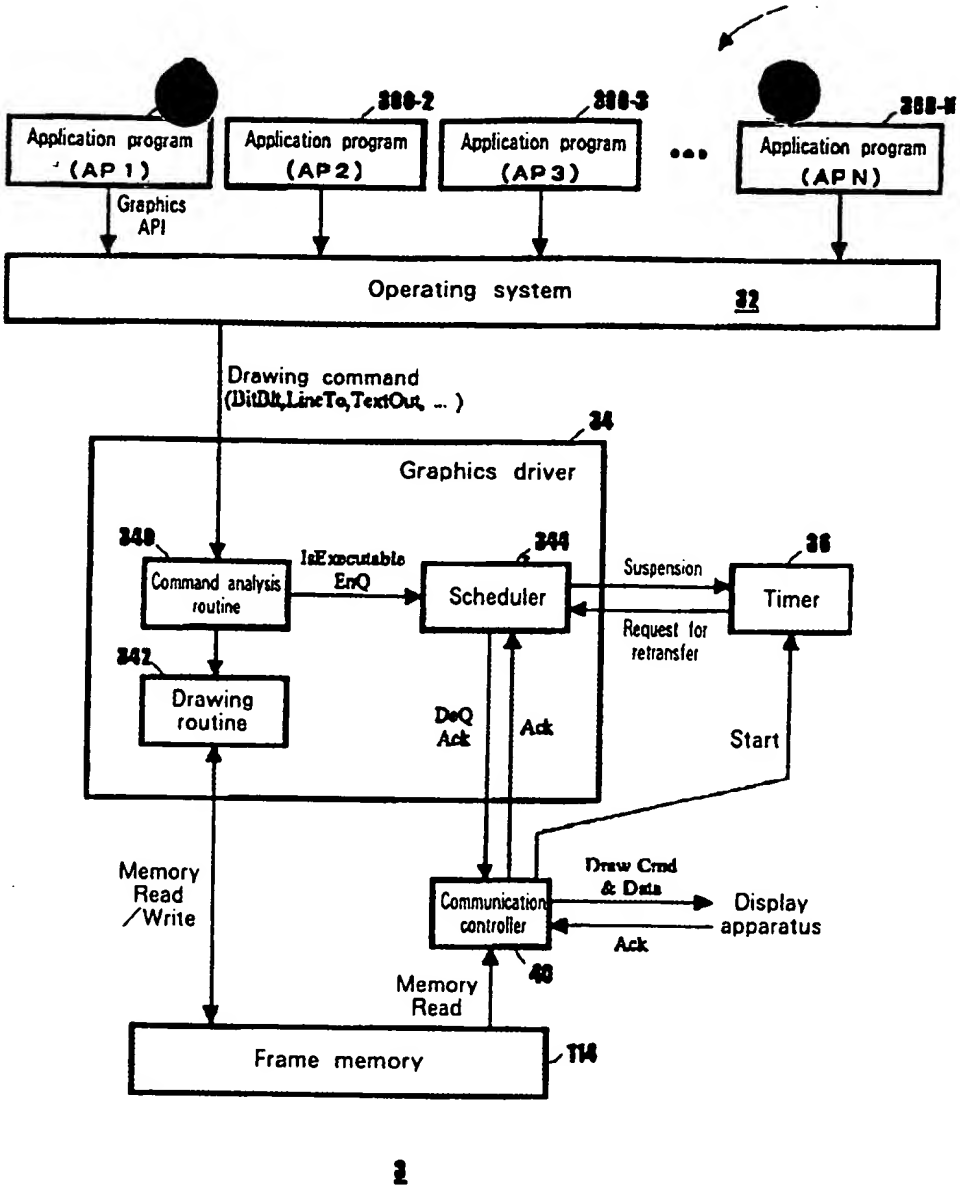


Fig. 6

Attributes of drawing area	Coordinates of drawing location	Size of drawing areas	Attributes of source areas	Coordinates of source areas	ROP

Fig. 7

Attributes of drawing areas	Attributes of source areas	Attributes of mask pattern	Clipping information	Color information	Coordinates and size of drawing location	Coordinates of mask pattern	Attributes of pattern	Coordinates of pattern

Fig. 8

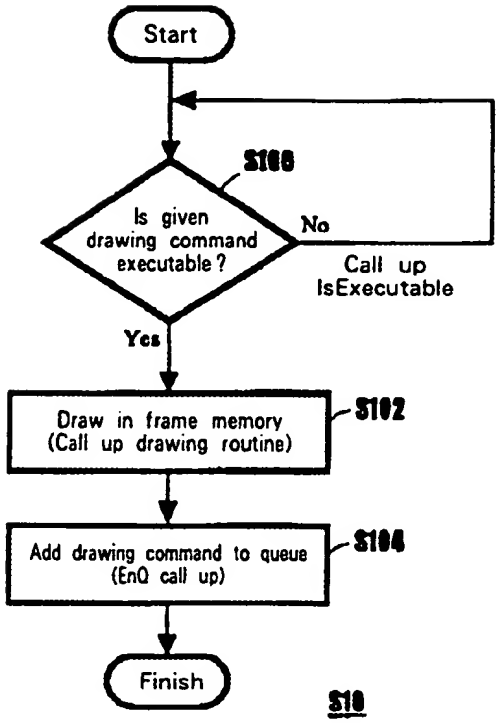


Fig. 9

Kind of command	Length of data	Data proper to command

Fig. 10

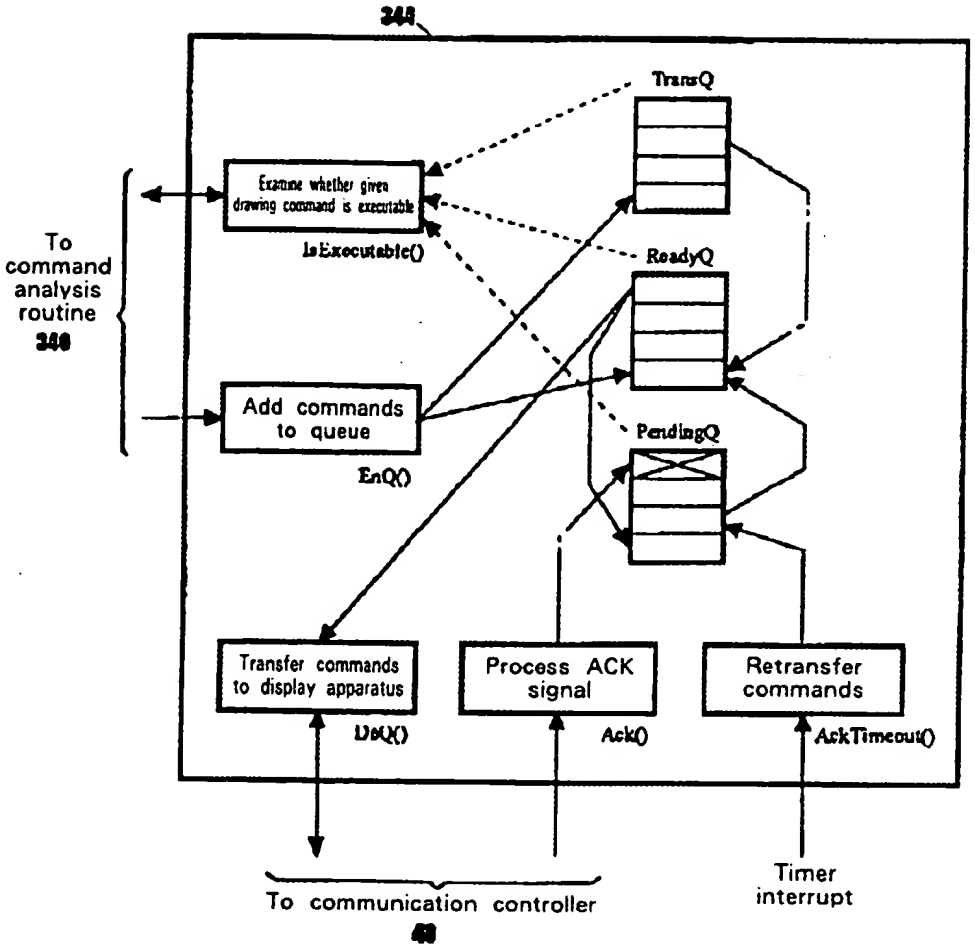

TransQ
Examine whether given drawing command is executable
IsExecutable()
ReadyQ
To command analysis routine
Add commands to queue
EnQ()
PendingQ
Transfer commands to display apparatus
DeQ()
Process ACK signal
Ack()
Retransfer commands
AckTimeout()
To communication controller
Timer interrupt

Fig. 11

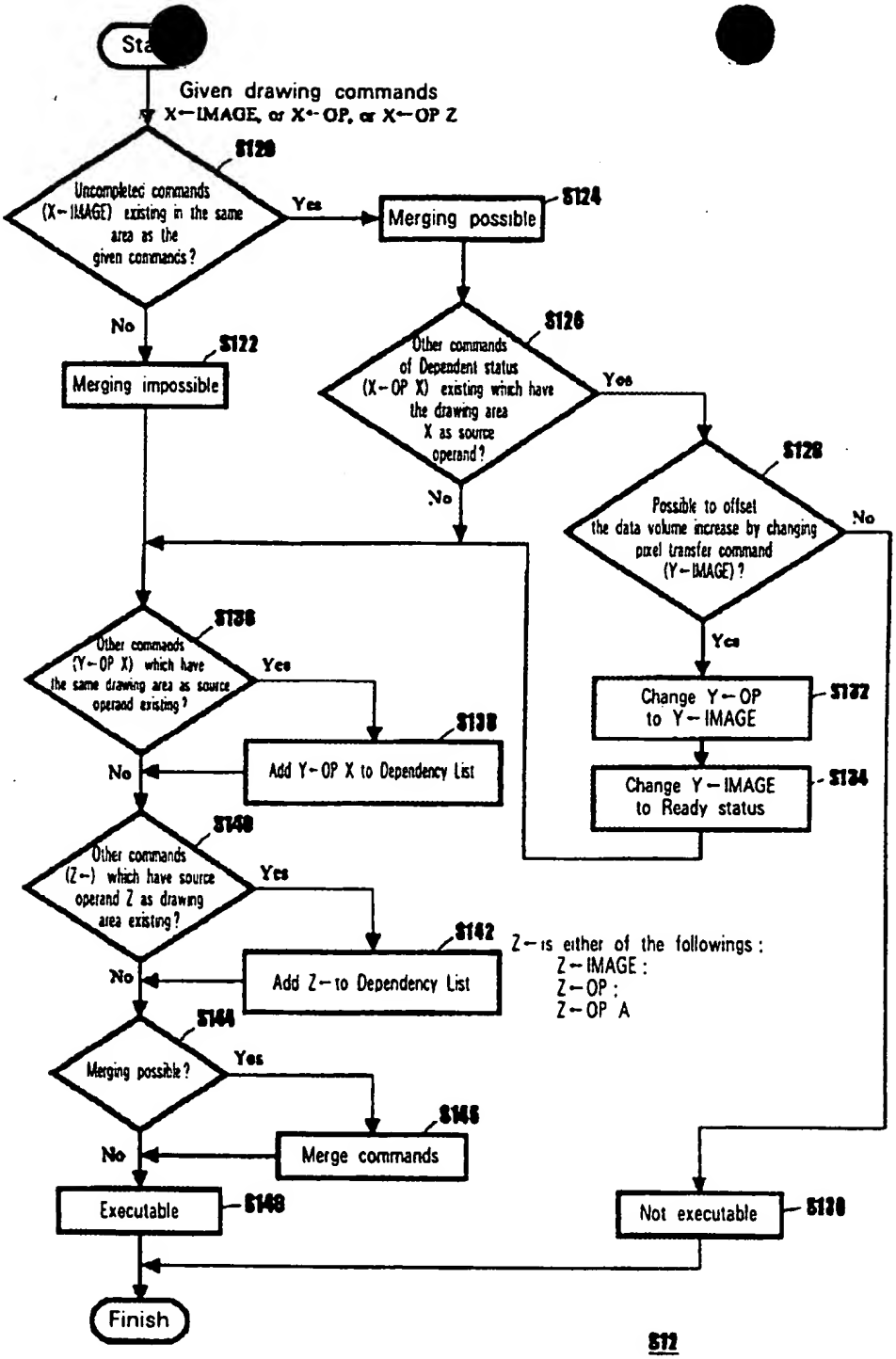

Sta
Given drawing commands
X←IMAGE, or X←OP, or X←OP Z
S120
Uncompleted commands (X←IMAGE) existing in the same area as the given commands?
Yes
No
S124
Merging possible
S122
Merging impossible
S126
Other commands of Dependent status (X←OP X) existing which have the drawing area X as source operand?
Yes
No
S128
Possible to offset the data volume increase by changing pixel transfer command (Y←IMAGE)?
No
Yes
S136
Other commands (Y←OP X) which have the same drawing area as source operand existing?
Yes
No
S138
Add Y←OP X to Dependency List
S132
Change Y←OP to Y←IMAGE
S134
Change Y←IMAGE to Ready status
S140
Other commands (Z←) which have source operand Z as drawing area existing?
Yes
No
S142
Add Z←to Dependency List
Z←is either of the followings:
Z←IMAGE:
Z←OP:
Z←OP A
S144
Merging possible?
Yes
No
S146
Merge commands
Executable
S148
Not executable
S130
Finish
S12

Fig. 12

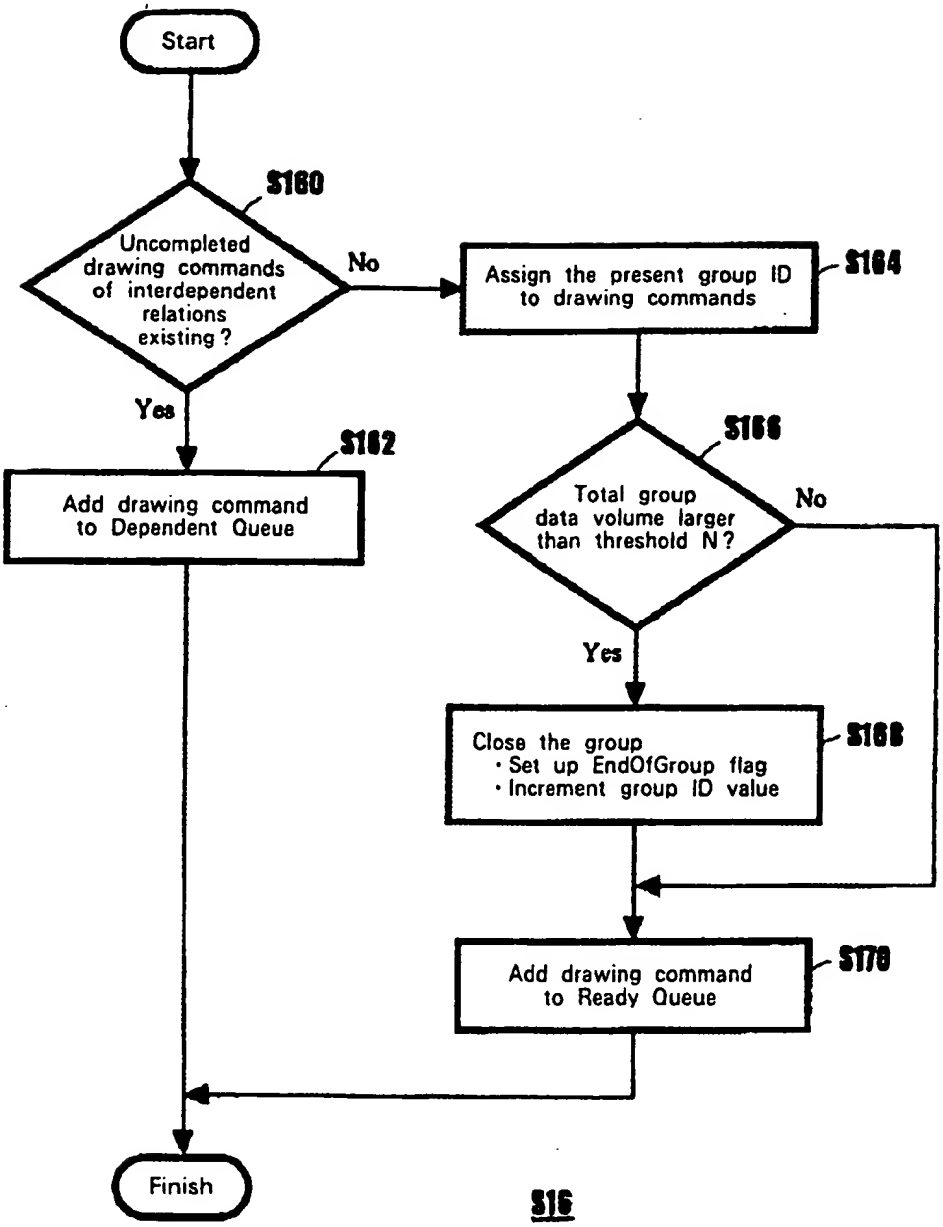
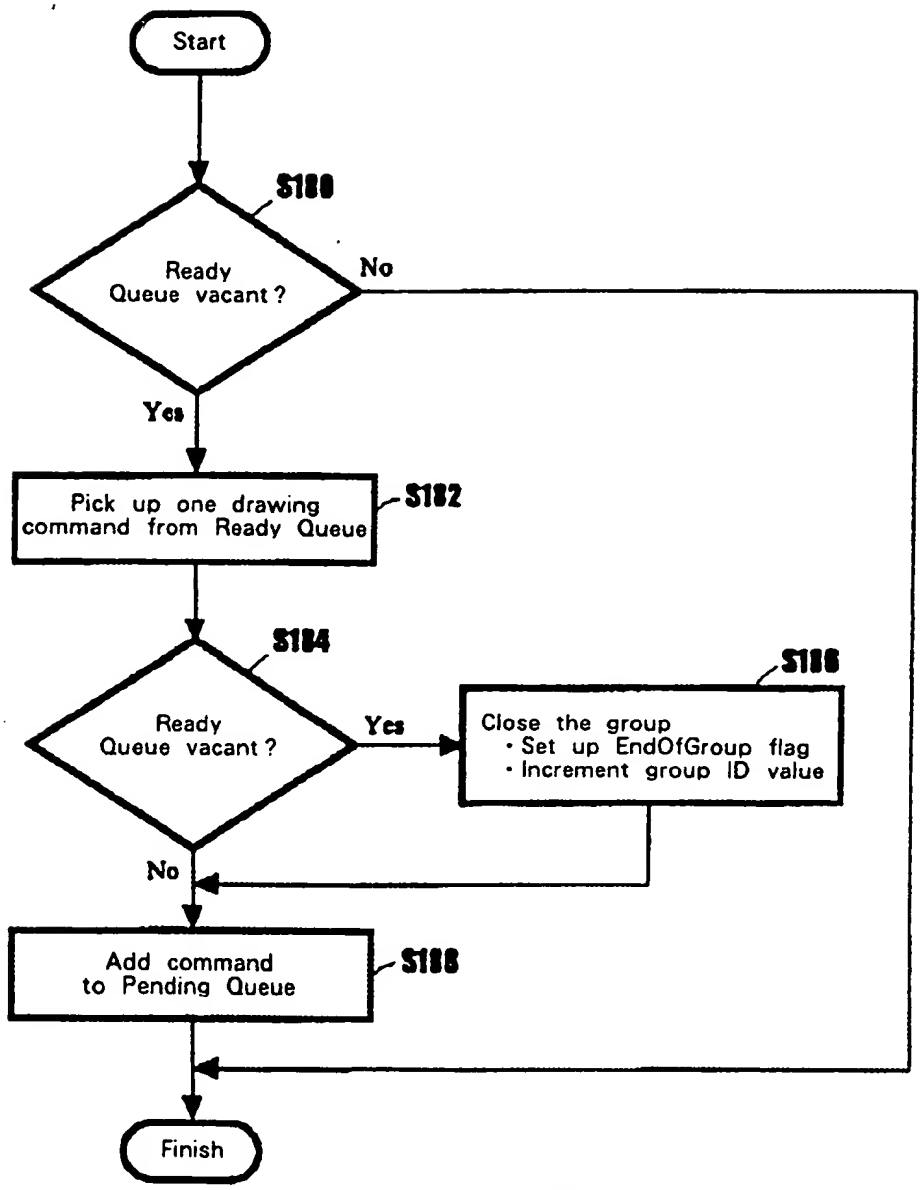
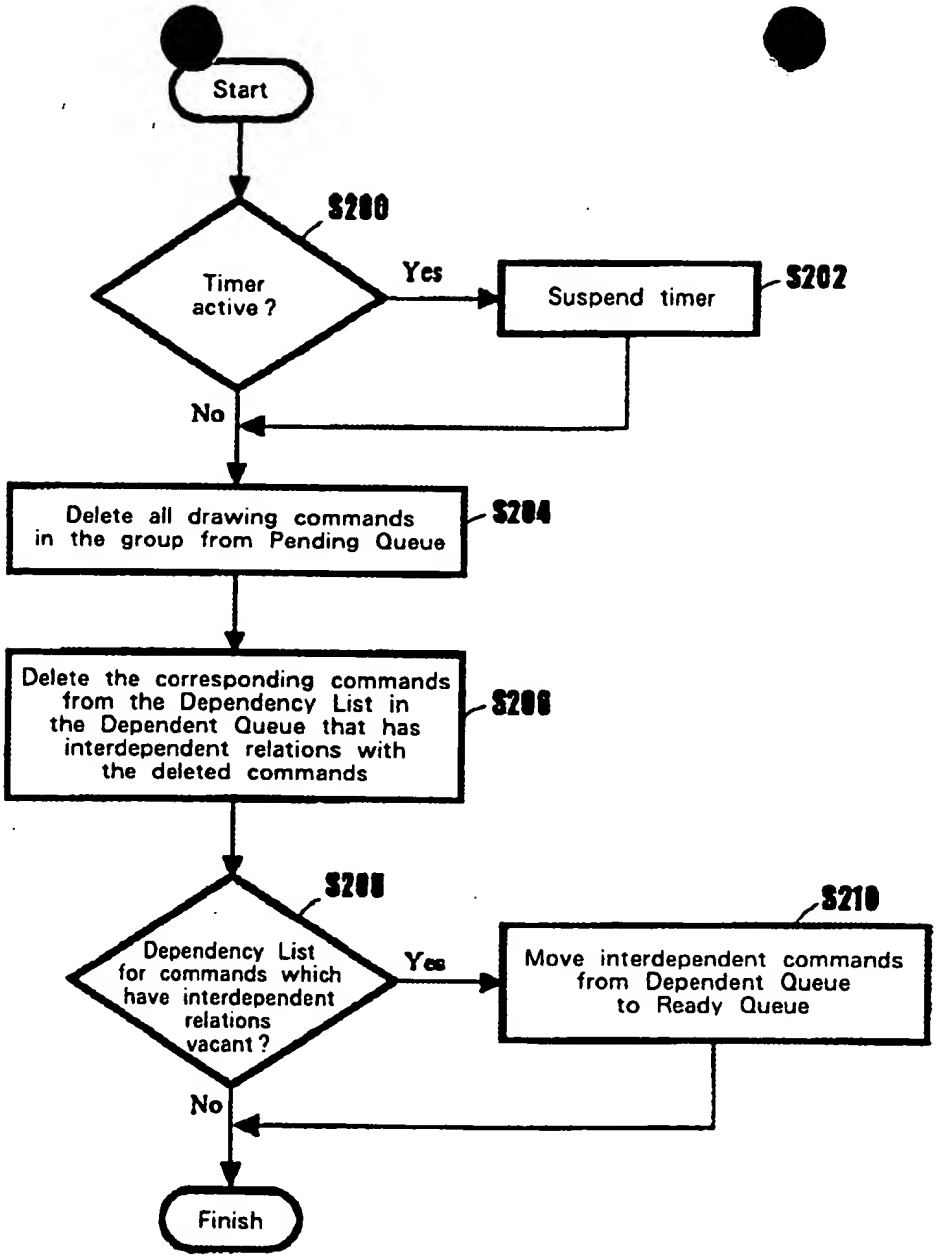

Start
S160
Uncompleted drawing commands of interdependent relations existing ?
No
Yes
S162
Add drawing command to Dependent Queue
S164
Assign the present group ID to drawing commands
S166
Total group data volume larger than threshold N ?
No
Yes
S168
Close the group
• Set up EndOfGroup flag
• Increment group ID value
S170
Add drawing command to Ready Queue
Finish
S16

Fig. 13


Start
S180
Ready Queue vacant ?
No
Yes
Pick up one drawing command from Ready Queue
S182
S184
Ready Queue vacant ?
Yes
S186
Close the group
• Set up EndOfGroup flag
• Increment group ID value
No
Add command to Pending Queue
S188
Finish

S18

Fig. 14


Start
S200
Timer active ?
Yes
Suspend timer
S202
No
Delete all drawing commands in the group from Pending Queue
S204
Delete the corresponding commands from the Dependency List in the Dependent Queue that has interdependent relations with the deleted commands
S206
S208
Dependency List for commands which have interdependent relations vacant ?
Yes
S210
Move interdependent commands from Dependent Queue to Ready Queue
No
Finish

S20

Fig. 15

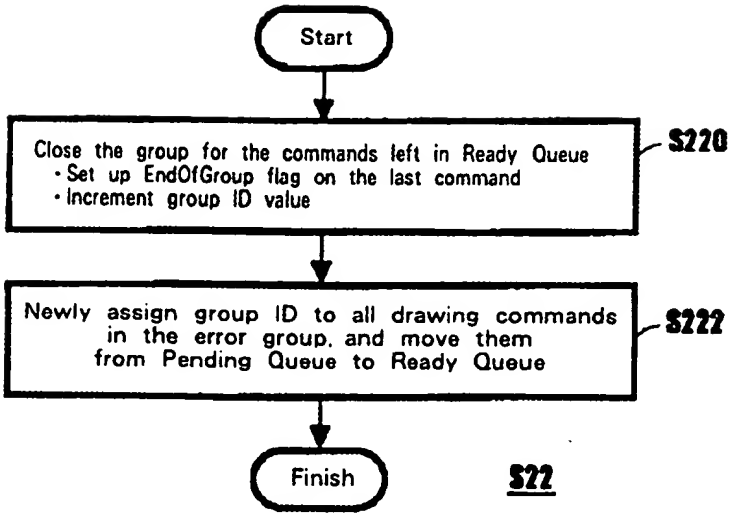

Start
Close the group for the commands left in Ready Queue
• Set up EndOfGroup flag on the last command
• Increment group ID value
S220
Newly assign group ID to all drawing commands in the error group, and move them from Pending Queue to Ready Queue
S222
Finish
S22

Fig. 16

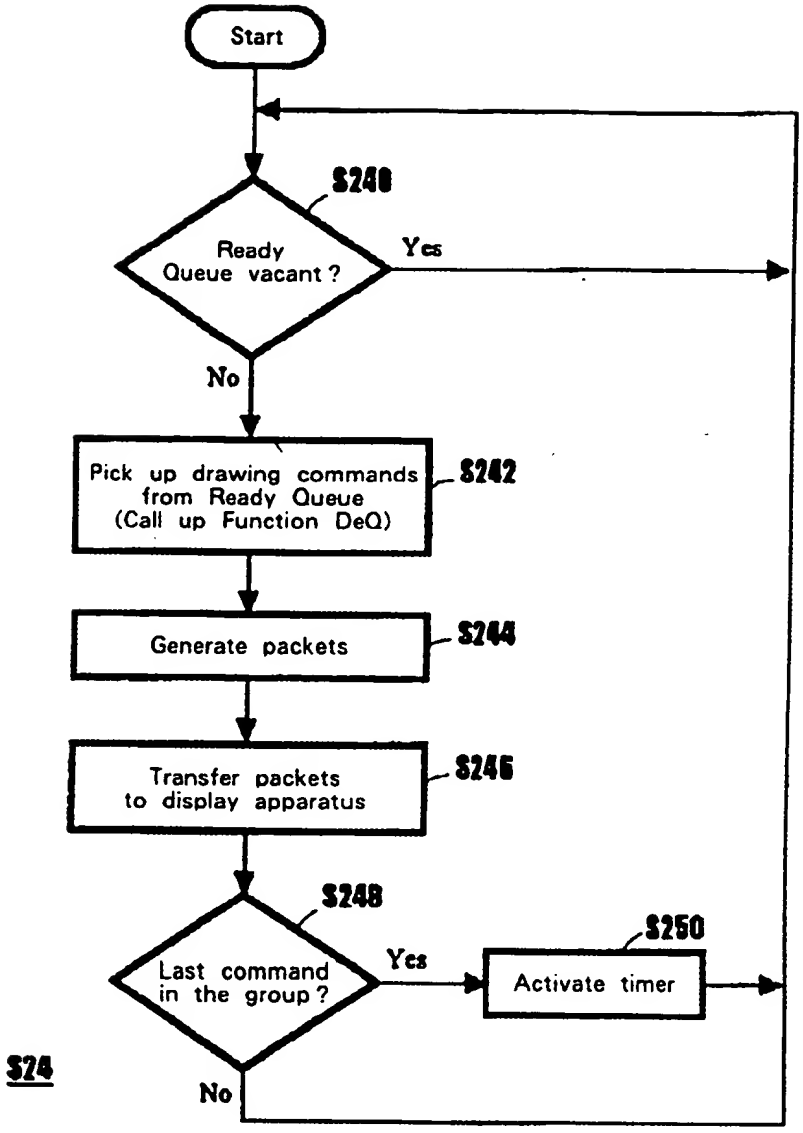

Start
S240
Ready Queue vacant ?
Yes
No
Pick up drawing commands from Ready Queue (Call up Function DeQ)
S242
Generate packets
S244
Transfer packets to display apparatus
S246
S248
Last command in the group ?
Yes
S250
Activate timer
No
S24

Fig. 17

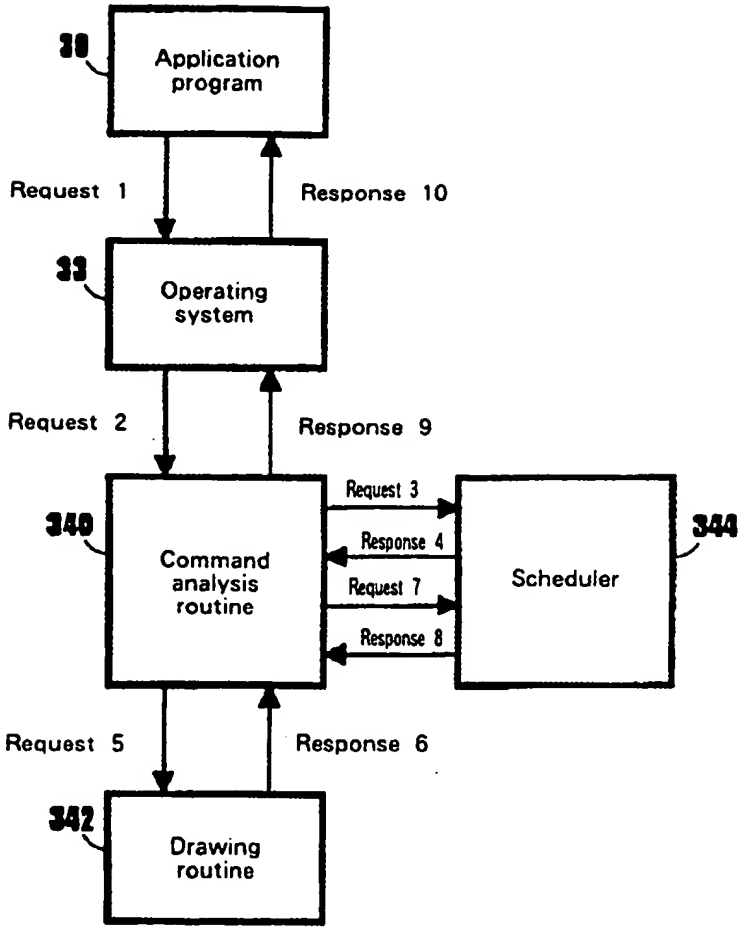

Application program
Request 1
Response 10
Operating system
Request 2
Response 9
Command analysis routine
Request 3
Response 4
Request 7
Response 8
Scheduler
Request 5
Response 6
Drawing routine

Fig. 18

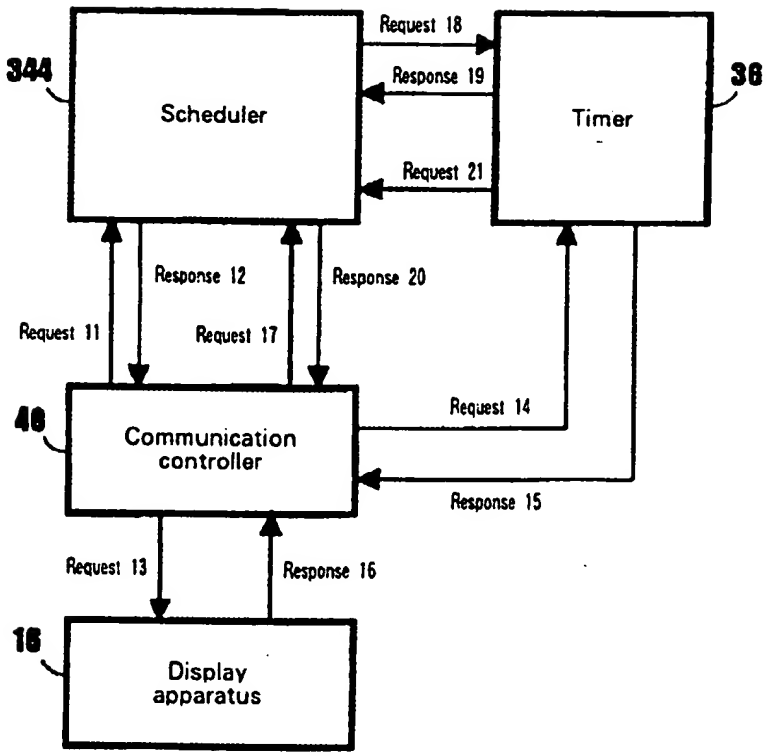

344
Scheduler
Request 18
Response 19
Request 21
36
Timer
Response 12
Request 11
Request 17
Response 20
48
Communication controller
Request 14
Response 15
Request 13
Response 16
16
Display apparatus

Fig. 19